WHAT IS CLAIMED IS:

1. An apparatus for driving a liquid crystal display, said display comprising an array of elongated row and an array of elongated column electrodes arranged transverse to the row electrodes, wherein overlapping areas of the two arrays of electrodes define pixels of the display when viewed in a viewing direction, said apparatus comprising:

at least two separate power sources; and

a circuit responsive to the at least two power sources and supplying electrical potentials to the row and column electrodes, to cause the display to display desired images, wherein at least one of the electrical potentials supplied to the row and column electrodes floats with a voltage supplied or caused to be supplied by one of the power sources.

Sub B1

2. The apparatus of claim 1, the circuit including a control device and at least one energy storage device to supply said at least one of the electrical potentials, wherein the control device causes the at least one energy storage device to be charged in a first phase, and connects said at least one energy storage device to the voltage supplied or caused to be supplied by said one of the power sources and to the row or column electrodes in a later second phase, so that said at least one of the electrical potentials supplied by said at least one energy storage device to the row or column electrodes floats with said voltage.

Sub A1

3. The apparatus of claim 2, wherein at least one energy storage device has at least two terminals, wherein the control device causes one terminal to be connected to the voltage and another terminal to be connected to the row and column electrodes, wherein said another terminal supplies said at least one of the electrical potentials that floats with the voltage.

Sub B1

4. The apparatus of claim 2, the at least one energy storage device including one or more capacitors.

Sub A2

5. The apparatus of claim 2, wherein the control device also causes the at least one energy storage device to supply electrical potentials to the row or column electrodes during the first phase.

Sub B1

6. The apparatus of claim 2, said at least two power sources supplying respectively a first and a second voltage and a common reference voltage, the difference between the second and the reference voltages defining a voltage differential, said control device comprising a first set of switches that causes a set of voltages to be generated that are above the reference voltage or below the first voltage by an integer multiple of the voltage differential.

Sub B1

7. The apparatus of claim 6, said control device further comprising a second set of switches that connect said set of voltages at selected times to the row and column electrodes so that the electrodes are driven by an IAPT driving method.

8. The apparatus of claim 6, wherein some of the voltages in the set of voltages float with the reference voltage during some field addressing cycles and other voltages in the set of voltages float with the first voltage during other field addressing cycles.

Sub A3

9. The apparatus of claim 2, said circuit including two energy storage devices each having two terminals, wherein the control device causes the two energy storage devices to be connected in parallel to the power sources during the first phase to charge the energy storage devices, so that they are charged to substantially the same voltage across their terminals.

10. The apparatus of claim 2, said circuit including two energy storage devices each having two terminals, wherein the control device causes the two energy storage devices to be connected in series to the power source during the first phase to charge the energy storage devices.

Sub B1

11. The apparatus of claim 2 wherein the electrical potentials supplied by the circuit to the row electrodes are of a predetermined amplitude above a reference voltage in some field addressing cycles and of the predetermined amplitude below the reference voltage in other field addressing cycles, wherein the electrical potentials supplied by the circuit have a dynamic range substantially equal to said amplitude.

Sub A4

12. The apparatus of claim 1, said circuit including two energy storage devices, wherein the devices are charged by one of the power sources during a portion of at least one

field addressing cycle and used to supply electrical potentials to a row or column electrode in a different portion of such field addressing cycle, wherein the devices are charged for a fraction of such different portion to compensate for charge consumption.

13. The apparatus of claim 1, said apparatus being an integrated circuit having a substrate, wherein the first and second power sources supply only electrical potentials that are higher or lower than a reference potential of the substrate.

14. An apparatus for driving a liquid crystal display, said display comprising an array of elongated row and an array of elongated column electrodes arranged transverse to the row electrodes, wherein overlapping areas of the two arrays of electrodes define pixels of the display when viewed in a viewing direction, said apparatus comprising:

Sub B1

at least two separate power sources;

wherein one or more of the power sources drives the row electrodes through a first voltage range, and drives the column electrodes through a second voltage range, wherein the first voltage range changes over different field addressing cycles, and the second voltage range floats with the first voltage range when the first voltage range changes and with at least the voltage generated or caused to be generated by one of the power sources.

15. The apparatus of claim 14, wherein the first voltage range is between a non-scanning voltage value and a scanning voltage value, and wherein the second voltage range floats with the non-scanning voltage value.

Sub A5

16. The apparatus of claim 15, wherein the first power source includes a first power supply, wherein the second power source includes a pair of capacitors, said apparatus further comprising a switching circuit connecting the first power supply and the capacitors to cause the second voltage range to float about the non-scanning voltage value.

17. The apparatus of claim 16, wherein the pair of capacitors are connected in a voltage divider configuration separating three nodes, wherein the switching circuit causes one of the nodes in between the pair to be at the non-scanning voltage of the first voltage range in at least one field addressing cycle.

Sub B1

18. The apparatus of claim 17, wherein the switching circuit causes voltages at one of the two remaining nodes to be supplied to a connections to a column electrode during at least one field addressing cycle.

19. The apparatus of claim 15, wherein the capacitors are charged by the first or second power source during a portion of at least one field addressing cycle and used to supply electrical potentials to a row or column electrode in a different portion of such field addressing cycle, wherein the capacitors are charged for a fraction of such different portion to compensate for charge consumption.

Sub B1

20. The apparatus of claim 19, wherein the column electrodes are driven by column drivers, and wherein the column electrodes are substantially disconnected from column drivers during said fraction of such different portion to preserve column signals that have been applied to the column electrodes.

21. The apparatus of claim 14, said apparatus being an integrated circuit having a substrate, wherein the first and second power sources supply only electrical potentials that are higher or lower than a reference potential of the substrate.

Sub A6

22. The apparatus of claim 14, one of the power sources including at least one power supply and a capacitor, said capacitor connected to a connection node for each of the column electrodes and storing charges from a column electrode during one column addressing cycle, said second power source further including a switching circuit that cause said stored charges to be applied to said column electrode in a subsequent column addressing cycle.

23. An apparatus for driving a liquid crystal display, said display comprising an array of elongated row and an array of elongated column electrodes arranged transverse to the row electrodes, wherein overlapping areas of the two arrays of electrodes define pixels of the display when viewed in a viewing direction, said apparatus comprising:

Sub B1

at least two separate power sources; and

a circuit responsive to the at least two power sources and supplying electrical potentials to the row and column electrodes, to cause the display to display desired images;

Sub B1

~~wherein the electrical potentials supplied by the circuit to the row electrodes are of a predetermined amplitude above a reference voltage in some field addressing cycles and of the predetermined amplitude below the reference voltage in other field addressing cycles, wherein the electrical potentials supplied by the circuit have a dynamic range substantially equal to said amplitude.~~

Sub A7

~~24. The apparatus of claim 23, said at least two power sources supplying a reference voltage and a voltage above or below the reference voltage of an amplitude suitable for driving the row electrodes, said circuit including a capacitor and a selection circuit selectively connecting the at least two power sources and the capacitor to each of the row electrodes, so that positive going pulses of said amplitude in reference to the reference voltage are applied in some field addressing cycles to the row electrodes and negative going pulses of said amplitude in reference to the reference voltage are applied to the row electrodes in other field addressing cycles for the row electrodes.~~

Sub B1

~~25. A method for driving a liquid crystal display, said display comprising an array of elongated row and an array of elongated column electrodes arranged transverse to the row electrodes, wherein overlapping areas of the two arrays of electrodes define pixels of the display when viewed in a viewing direction, said method comprising~~

~~supplying electrical potentials to the row and column electrodes, to cause the display to display desired images;~~

~~wherein said supplying includes charging and discharging at least one energy storage device to supply said at least one of the electrical potentials.~~

Sub A8

~~26. The method of claim 25, wherein at least one of the electrical potentials supplied to the row or column electrodes floats with a voltage supplied by a power source, wherein said supplying includes charging the at least one energy storage device in a first phase, and connects said at least one energy storage device to the row or column electrodes in a later second phase, so that said at least one of the electrical potentials supplied by said at least one energy storage device to the row or column electrodes floats with said voltage.~~

Sub B1

~~27. The method of claim 26, wherein said at least one energy storage device has at least two terminals, wherein the supplying causes one terminal to be connected to the voltage and another terminal to be connected to the row and column electrodes, and causes said~~

another terminal to supply said at least one of the electrical potentials that floats with the voltage.

28. The method of claim 25, wherein said supplying comprises connecting an energy storage device alternately to a power supply and at least one column electrode.

29. The method of claim 28, said supplying comprising connecting the power supply and the at least one column electrode to a first and a second electrical energy storage device in alternate row scanning cycles.

30. The method of claim 29, wherein said supplying connects the power supply and the at least one column electrode to the two energy storage devices according to a switching timing waveform that is delayed relative to said row scanning cycles, so that at least one of the energy storage devices is connected to the at least one column electrode during a portion of a row scanning cycle, and the remaining energy storage device is connected to the at least one column electrode during another portion of such row scanning cycle.

31. The method of claim 30, wherein said time delay is such that a major portion of the energy of the first energy storage device is transferred to the at least one column electrode during a beginning portion of such row scanning cycle, thereby driving the voltage of said at least one column electrode to close to a target value, and a minor portion of the energy of the second energy storage device is transferred to the at least one column electrode during but after the beginning portion of such row scanning cycle, thereby driving the voltage of said at least one column electrode to substantially the target value.

32. The method of claim 30, wherein said switching timing waveform is such that during a portion of such row scanning cycle, both the first and the second energy storage devices are connected to the at least one column electrode.

33. The method of claim 29, wherein the first energy storage drives the voltage of said at least one column electrode to close to a target value during a beginning portion of a row scanning cycle, and the second energy storage device drives the voltage of said at least

one column electrode to substantially the target value during but after the beginning portion of such row scanning cycle.

34. The method of claim 33, wherein a major portion of the energy of the first energy storage device is transferred to the at least one column electrode during a beginning portion of a row scanning cycle, thereby driving the voltage of said at least one column electrode to close to a target value, and a minor portion of the energy of the second energy storage device is transferred to the at least one column electrode during but after the beginning portion of such row scanning cycle, thereby driving the voltage of said at least one column electrode to substantially the target value.

35 The method of claim 29, wherein during a portion of a row scanning cycle, both the first and the second energy storage devices are connected to the at least one column electrode.

Sub B1

36. An apparatus for driving a liquid crystal display, said display comprising an array of elongated row and an array of elongated column electrodes arranged transverse to the row column electrodes, wherein overlapping areas of the two arrays of column electrodes define pixels of the display when viewed in a viewing direction, said apparatus comprising:

a power supply;

at least one electrical energy storage device; and

a switching circuit connecting the power supply to the device to charge the device and connecting the device to at least one of the column electrodes to supply electrical potential(s) thereto, wherein the display displays desired images.

Sub A2

37. The apparatus of claim 36, wherein said power supply includes a voltage regulator, a comparator and a current source.

38. The apparatus of claim 36, wherein said circuit connects the device alternately to the power supply and the at least one column electrode.

Sub B1

39. The apparatus of claim 36, said apparatus comprising a first and a second electrical energy storage device, wherein said circuit connects the power supply and the at

least one column electrode to the two energy storage devices in alternate row scanning cycles.

40. The apparatus of claim 39, wherein said circuit connects the power supply and the at least one column electrode to the two energy storage devices according to a switching timing waveform that is delayed relative to said row scanning cycles, so that at least one of the energy storage devices is connected to the at least one column electrode during a portion of a row scanning cycle, and the remaining energy storage device is connected to the at least one column electrode during another portion of such row scanning cycle.

41. The apparatus of claim 40, wherein said time delay is such that a major portion of the energy of the first energy storage device is transferred to the at least one column electrode during a beginning portion of such row scanning cycle, thereby driving the voltage of said at least one column electrode to close to a target value, and a minor portion of the energy of the second energy storage device is transferred to the at least one column electrode during but after the beginning portion of such row scanning cycle, thereby driving the voltage of said at least one column electrode to substantially the target value.

42. The apparatus of claim 40, wherein said switching timing waveform is such that during a portion of such row scanning cycle, both the first and the second energy storage devices are connected to the at least one column electrode.

43. The apparatus of claim 39, wherein the first energy storage drives the voltage of said at least one column electrode to close to a target value during a beginning portion of a row scanning cycle, and the second energy storage device drives the voltage of said at least one column electrode to substantially the target value during but after the beginning portion of such row scanning cycle.

44. The apparatus of claim 43, wherein a major portion of the energy of the first energy storage device is transferred to the at least one column electrode during a beginning portion of a row scanning cycle, thereby driving the voltage of said at least one column electrode to close to a target value, and a minor portion of the energy of the second energy storage device is transferred to the at least one column electrode during but after the

SUB B1

beginning portion of such row scanning cycle, thereby driving the voltage of said at least one column electrode to substantially the target value.

45. The apparatus of claim 39, wherein during a portion of a row scanning cycle, both the first and the second energy storage devices are connected to the at least one column electrode.